

Safety Data Sheet

Urethane

Division of Safety
National Institutes
of Health



WARNING!

THIS COMPOUND IS ABSORBED THROUGH THE SKIN, THROUGH THE INTESTINAL AND RESPIRATORY TRACTS, AND TRANSPLACENTALLY. IT IS SLIGHTLY TOXIC, CARCINOGENIC, AND TERATOGENIC. AVOID FORMATION AND BREATHING OF AEROSOLS.

LABORATORY OPERATIONS SHOULD BE CONDUCTED IN A FUME HOOD, GLOVE BOX, OR VENTILATED CABINET.

AVOID SKIN CONTACT: IF EXPOSED, WASH WITH SOAP AND WATER.

FOR EYE EXPOSURE, IRRIGATE IMMEDIATELY WITH LARGE AMOUNTS OF WATER. FOR INGESTION, DRINK PLENTY OF WATER. INDUCE VOMITING. FOR INHALATION, REMOVE VICTIM PROMPTLY TO CLEAN AIR. ADMINISTER RESCUE BREATHING IF NECESSARY. REFER TO PHYSICIAN.

IN CASE OF LABORATORY SPILL, WEAR PROTECTIVE CLOTHING DURING CLEANUP. AVOID SKIN CONTACT OR BREATHING OF AEROSOLS. USE WATER TO DISSOLVE COMPOUND. WASH DOWN AREA WITH SOAP AND WATER. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY.

A. Background

Urethane is a colorless, odorless, crystalline or amorphous powder, with a slightly bitter taste; it is volatile at room temperature. It is very slightly toxic, with weak hypnotic effects. It is carcinogenic and teratogenic in rodents. Its main commercial use is as a chemical intermediate in the production of pesticides, fumigants, and cosmetics. It has also been used as a diuretic and as an anesthetic for small animals.

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Chemical and Physical Data

1. Chemical Abstract No.: 51-79-6
2. Synonyms:

Urethan	Ethylurethan
Leucothane	Ethyl urethane
Procarbamin	Ethyl carbamate
Carbamic acid, ethyl ester (9CI)	
3. Molecular
 formula: structure: $\text{H}_2\text{N}-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{O}-\text{CH}_2-\text{CH}_3$
 $\text{C}_3\text{H}_7\text{NO}_2$
 weight:
 89.11
4. Density: 0.9862 g/cm³; vapor density, 3.07.
5. Absorption spectroscopy: No data.
6. Volatility: Vapor pressure = 10 mm Hg at 77.8°C. (For vapor pressures at higher temperatures, see p. D-205 in Weast [1979])
7. Solubility: 1.0 g is soluble at 25°C in 0.5 ml water, 0.8 ml ethanol, 0.9 ml chloroform, 1.5 ml ether. Soluble in chlorinated hydrocarbons; insoluble in aliphatic hydrocarbons.
8. Description, appearance: Colorless, odorless crystals or white granular powder; slightly bitter taste.
9. Boiling point: 185°C.
 Melting point: 48.19°C (sublimes).
10. Stability: No data.
11. Chemical reactivity: Decomposed by hot aqueous acids or alkalis to ethanol, CO₂, and ammonia.
12. Flash point: No data.
13. Autoignition temperature: No data.
14. Explosive limits in air: No data.

Fire, Explosion, and Reactivity Hazard Data

1. Urethane does not require special fire-fighting procedures or equipment and does not present unusual fire and explosion hazards.
2. No conditions contributing to instability are known to exist.
3. No incompatibilities are known.
4. No hazardous decomposition products have been identified.
5. Urethane does not require nonspark equipment.

Operational Procedures

The NIH Guidelines for the Laboratory Use of Chemical Carcinogens describe operational practices to be followed when potentially carcinogenic chemicals are used in NIH laboratories. The Guidelines should be consulted to identify the proper use conditions required and specific controls to be implemented during normal and complex operations or manipulations involving urethane.

1. Chemical inactivation: No validated method reported.
2. Decontamination: Turn off equipment that could be affected by urethane or the materials used for cleanup. If more than 10 g has been spilled or if there is any uncertainty regarding the procedures to be followed for decontamination, call the NIH Fire Department (dial 116) for assistance. Wash surfaces with copious quantities of water. Glassware should be rinsed (in a hood) with water, followed by soap and water. Animal cages should be washed with water.
3. Disposal: No waste streams containing urethane shall be disposed of in sinks or general refuse. Surplus urethane or chemical waste streams contaminated with urethane shall be handled as hazardous chemical waste and disposed of in accordance with the NIH chemical waste disposal system. Nonchemical waste (e.g., animal carcasses and bedding) containing urethane shall be handled and packaged for incineration in accordance with the NIH medical-pathological waste disposal system. Potentially infectious waste (e.g., tissue cultures) containing urethane shall be packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with urethane shall be handled as potentially infectious waste and packaged for incineration, as above. Absorbent materials (e.g., associated with spill cleanup) grossly contaminated shall be handled in accordance with the chemical waste disposal system. Radioactive waste containing urethane shall be handled in accordance with the NIH radioactive waste disposal system.

4. Storage: Store in sealed ampoules or in screw-capped bottles (or vials) with Teflon cap liners.

Monitoring and Measurement Procedures Including Direct Field Measurements and Sampling for Subsequent Laboratory Analysis

1. Sampling: No procedures have been published.
2. Separation and analysis: GC using the Coulson electrolytic detector has been used in the analysis of urethane in wine and other beverages (Walker et al., 1974; Ough, 1976), with a sensitivity of 1 ppb. This procedure probably can be adapted to the analysis of biological material.

Biological Effects (Animal and Human)

1. Absorption: Urethane is absorbed through the skin, through the gastrointestinal tract, and by inhalation; it also crosses the placental barrier.
2. Distribution: No data are available; considered to be evenly distributed.
3. Metabolism and excretion: This has been reviewed (Mirvish, 1968; IARC, 1974). Over 90% of urethane-derived carbon is exhaled as CO₂ in 24 hours after administration; other metabolic products are ammonia and ethanol. The remainder is converted to N-hydroxyurethane. Urinary excretion products are unchanged urethane, N-hydroxyurethane, and conjugation products of the latter.
4. Toxic effects: Urethane has a very low toxicity; published LD50s are 1.5 g/kg (rat, intraperitoneal), 1.4 g/kg (rat, intramuscular), and 2.7 g/kg (mouse, oral) (Fairchild, 1977). A toxic effect in small animals, at dosages of approximately 1 g/kg, is central nervous system depression.
5. Carcinogenic effects: In mice, rats, and hamsters, the most common types of tumor are lymphosarcomas, hepatic hemangiomas, mammary tumors, pulmonary adenomas, and adenocarcinomas. These are produced on administration via the oral, dermal, and inhalation routes. Transplacental carcinogenesis is prominent in mice, particularly if the dam is dosed on the day before delivery. Pulmonary tumors are especially prevalent.
6. Mutagenic and teratogenic effects: While some chromosomal aberrations have been found in tissue cultures, urethane is not mutagenic in the Ames test or in the mouse. It is strongly teratogenic in mice.

Emergency Treatment

1. Skin and eye exposure: For skin exposure, remove contaminated

clothing and wash skin with soap and water. For eye exposure, irrigate immediately with copious quantities of running water for at least 15 minutes.

2. Ingestion: Drink plenty of water. Induce vomiting.
3. Inhalation: Remove victim promptly to clean air. Administer rescue breathing if necessary.
4. Refer to physician.

References

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- Mirvish, S.S. 1968. The carcinogenic action and metabolism of urethan and N-hydroxyurethan. *Adv Cancer Res* 11:1-42.
- Ough, C.S. 1976. Ethylcarbamate in fermented beverages and foods. I. Naturally occurring ethylcarbamate. *J Agric Food Chem* 24:323-328.
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